(No Model.)

L. DION.

SYSTEM OF ELECTRICAL PROPULSION FOR RAILWAY CARS.

No. 536,855. Patented Apr. 2, 1895.

Fig. 1.

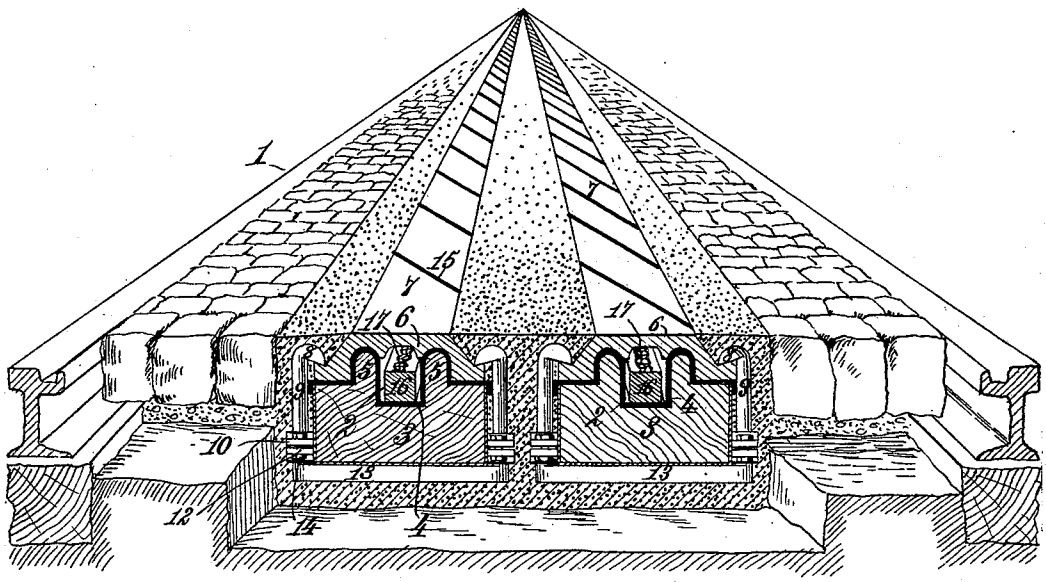


Fig. 4.

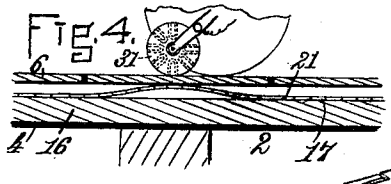


Fig. 2.

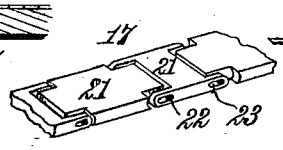
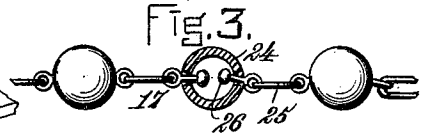


Fig. 3.



WITNESSES.

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SYSTEM OF ELECTRICAL PROPULSION FOR RAILWAY-CARS.

SPECIFICATION forming part of Letters Patent No. 536,855, dated April 2, 1895.

Application filed June 14, 1894. Serial No. 514,596. (No model.)

To all whom it may concern:

Be it known that I, LÉON DION, a citizen of the United States, residing at Natick, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Systems of Electrical Propulsion for Railway-Cars, of which the following is a specification.

My invention relates to systems of electrical propulsion for railway cars, and especially to that class, or type of improvements in which the electrical conductors are placed in closed conduits, or sub-ways.

It is the purpose of my invention to provide a closed conduit, containing a main electrical conductor and a flexible, auxiliary conductor, which is normally in continuous contact with the main conductor and is picked up, or lifted, by magnetic attraction and brought into electrical contact with the conducting cover of the conduit at a point beneath the car, the current being taken off the surface of the cover by suitable brushes, or other devices, carried by the car.

It is the purpose of my invention to so construct the auxiliary conductor that ample provision shall be made not only for the expansion and contraction due to sudden and extreme changes of temperature, but for a series of local extensions due to the presence of a number of cars upon the same line of track and at varying intervals of separation, and to enable the several contact-points of the auxiliary conductor to be maintained and to move with the individual trolleys, or brushes, as the cars are propelled.

The invention embraced in this specification is allied, in certain respects, to that contained in an application filed by Edwin D. Chaplin and myself, jointly, upon the 14th day of June, 1894, Serial No. 514,604.

My present specification comprises an auxiliary conductor which is formed of a series of members or portions connected by intermediate links of conducting material, which have a conductivity in an electrical sense, but are not necessarily susceptible to magnetic attraction.

The application filed by Edwin D. Chaplin, and myself, jointly, contains an invention differing from that covered by my present specification, and comprising an auxiliary conductor consisting of a series of strips each containing metal which is both magnetic and conducting, the ends of said strips being overlapped and connected together in such manner that they may have a sliding movement upon each other.

I make no claim in the present specification to anything substantially shown and described in the said joint application, Serial No. 514,604.

The invention consists, to the several ends specified, in the novel features of construction and in the parts and combinations of parts hereinafter fully described and then particularly pointed out and defined in the claims forming part of this specification.

To enable those skilled in the art to which my invention pertains to fully understand, and to construct and use the same, I will proceed to describe said invention in detail, reference being had, for such purpose, to the accompanying drawings, in which—

Figure 1 is a sectional perspective showing a single roadway with two separate, closed conduits, each constructed and equipped in accordance with my invention. Figs. 2 and 3 are detail views illustrating different forms of construction of the auxiliary conductor. Fig. 4 is a detail section, taken vertically in the longitudinal line of the conduit, showing the position assumed by the auxiliary conductor under the magnetic attraction of the trolley, or other device employed to take up the current.

The reference numeral 1, in said drawings, indicates an electric railway having separate conduits, or subways 2, arranged between the rails. Each conduit is formed by channeling a body of wood, preferably poplar, though I may use any other suitable material, or composition of materials. An insulation 4 forms a lining for the sides and bottom of the conduit and is extended laterally over ribs 5, which rise above the level of the horizontal side portions and extends over the latter to the margins of the wooden body 3. The top, or cover of the conduit, consists of a series of similarly shaped plates 6, having such form in cross-section as to seat over the ribs 5 and rest upon the insulation covering the horizontal side portions. The upper and outer surface of the plate is flat, to form a contact

face 7 for the trolley, or brush, which travels thereon with either rolling, or sliding friction, the former being, in some respects, regarded as preferable. From the parallel margins of this contact face 7 the plate slopes downward upon both sides, its edges being troughed, to engage the hooked heads 8 of bolts 9. These bolts are arranged, at suitable intervals, alongside the body-portions 5, and their lower ends are provided with lugs 10, having apertures which receive studs 12, the latter forming part of transverse sleepers 13 on which the body-portions 5 rest. Nuts 14 are turned upon the threaded ends of the studs to draw the bolts downward and clamp the plates securely and closely upon the interposed insulation 4. The plates are separated one from another by narrow intervals 15, which cross the contact face 7 diagonally, in order that the trolley, or brush, in traversing said face, may be continuously in electrical contact with one, or both of the adjacent plates, thus avoiding successive and abrupt, although momentary, interruptions of the current. The plates are formed of a material having electrical conductivity, but incapable of exerting magnetic attraction.

The conductor of electricity 16 is preferably square, or rectangular, though its form is subject to variation. It is usually formed of copper, or any metal having suitable conductivity, and is arranged in the conduit in any suitable manner, the proportions of the parts being relatively such that the flat, upper surface of the conductor lies near the lower, or inner face of the covering plates 6. Upon each conductor 16, both being alike in all essential respects, lies an auxiliary conductor 17, formed of material which has a suitable electrical conductivity and is susceptible to magnetic attraction without becoming permanently magnetic. Soft iron is usually employed for this purpose, as it possesses both these characteristics.

For the purpose of securing complete flexibility at every point, together with a capacity for longitudinal elongation and contraction, I prefer to make the auxiliary conductor of members or portions which are connected in such manner as to secure the qualities mentioned. I prefer to employ similar members or portions 21, as in Fig. 2, connected together pivotally, the pintles 22 lying in elongated bearings 23, which permit the required longitudinal extension. A different form of the same general type is shown in Fig. 3 and consists of hollow globes 24 connected by links 25 secured to headed connections 26 which lie in apertures in the globes.

The current is taken up by a trolley 31, though I may substitute a brush, or any suitable device for the purpose. In all cases, however, means must be provided for exerting a degree of magnetic attraction upon the auxiliary conductor sufficient to lift that portion which lies immediately beneath the trolley, or other device which takes up the current and conducts it to the motor. As the weight of the portion lifted is merely nominal and as it lies quite close to the contact-plates 6, one or more permanent magnets may be used for this purpose, arranged at any suitable point, as, for example, upon, or embedded in, the trolley, as shown in Fig. 4. As the surface-plates are not magnetic, there is no tendency on the part of the auxiliary conductor to adhere thereto, after the trolley has passed. It will be understood, of course, that an electro-magnet is the complete mechanical equivalent of a permanet magnet.

In order to increase the conductivity of the auxiliary conductor 17, I may construct it of two strips, or filaments 30, of copper, or other suitable metal, or alloy, with an interposed strip, or filament 29, of soft iron. This construction can be employed in any, or all, of the various forms in which this conductor is shown in the drawings. The different metals are united by any of the processes familiarly known in the arts, the filaments being merely sufficient to provide the required magnetic attraction.

The separation and insulation of the surface-plates 6, in the manner described, limits the field of electrical energy to the single plate upon which the trolley, or brush, rests. As the latter is beneath the body of the car, access thereto is impossible until the trolley shall have passed off and the car moved far enough to expose said plate. By this time the trolley will be removed a distance measured by two, or more, of the plates 6, so that all possibility of a shock is effectually prevented. The current for the motor is taken from one of the conductors shown in Fig. 1, and returns by the other conductor, the trolley or brush for the latter being constructed and operated substantially in the manner already indicated.

My invention enables me to use a conduit, or sub-way, which is entirely closed at all points, and which may, therefore, be rendered absolutely water-tight. By employing the method and means for removing moisture, or dampness, described in an application for Letters Patent filed of even date herewith, I am able, practically, to prevent all escape of current, reduce oxidation so far as to avoid material injury to the conductors, and maintain a condition favorable to the most perfect and economical transmission of electrical energy. Railway propulsion, under these conditions, may be made more effective, at a less expense than has heretofore been possible. By bringing the conductor much closer to the motor and reducing the loss of energy to a minimum, the line of road can be operated at a lower tension and with an outlay of mechanical power which is diminished in direct proportion thereto.

Since the installation of the various systems of electrical propulsion in use in this country, it has been found that the leakage from underground conductors, which may,

even with the most careful construction, be caused by moisture and even by ordinary dampness, introduces an element of great danger in cities and large towns where such systems are in use. Currents of high tension are enabled to reach gas and water pipes and many fires, and not a few fatal, or severe injuries, have been traced to this source. Moreover, the electric current has been found to exert an action upon underground metal pipes by which the latter are destroyed with great rapidity, the largest and strongest pipes becoming wholly disintegrated in a very few years. It has been estimated, recently, that miles of pipe in Hamilton, in the Province of Ontario, Canada, have been completely ruined in this manner, and in San Francisco, damage, to a great amount, though not as yet estimated, has been ascertained to be due to this cause.

My invention wholly avoids this danger, and besides removing a condition which threatens great injury and loss, it also overcomes a serious objection to the increase and extension of electric railways in large towns and cities.

What I claim is—

1. In an electrical railway, a closed conduit, having a cover or top capable of electrical conductivity, a main conductor of electricity, and an auxiliary conductor superimposed thereon and composed of members, or portions, connected together by intermediate links formed of conducting material, the connected portions of the conductor being susceptible to magnetic attraction, substantially as described.

2. In an electric railway, a closed conduit, having a top or cover capable of electrical conductivity, a main conductor of electricity and an auxiliary conductor imposed thereon and consisting of a series of similar members, or portions, formed of soft iron and connected by intermediate links, formed of conducting material, substantially as described.

3. In an electrical railway, the combination with a main conductor, arranged in a closed conduit having an electrically conducting cover, or top, of an auxiliary conductor imposed thereon and composed of a series of members, or portions, each consisting of a filament, or strip, of magnetic, conducting metal, inclosed between strips or filaments of conducting, non-magnetic metal and connected together by intermediate links formed of conducting material, substantially as described.

4. In an electrical railway, the combination with a main electrical conductor, of an auxiliary conductor lying on the main conductor and composed of a series of members, or portions, connected together by loose, intermediate links of conducting material, each intermediate connection being capable of a limited elongation and contraction by the slack of the links, substantially as described.

5. In an electrical railway, a closed conduit having a cover or top made in sections insulated one from the other and formed of metal which is capable of electrical conductivity, but not susceptible to magnetic attraction, a main electrical conductor and an auxiliary conductor both inclosed within and insulated from the bottom of said conduit, the auxiliary conductor being super-imposed upon the main conductor and composed of members, or portions, of conducting material, the connected members, or portions, of the auxiliary conductor being susceptible to magnetic attraction, substantially as described.

In testimony whereof I have hereunto set my hand and affixed my seal in presence of two subscribing witnesses.

LÉON DION. [L. S.]

Witnesses:
FRED JOY,
ALFRED C. SMITH.